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FOREST PRODUCTS LABORATORY † FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

SPECIAL METHODS OF SEASONING WOOD

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SOLVENT SEASONING

It has long been known that wood can be dried by heating it in a hot solvent maintained at a temperature above the boiling point of water, until all the water boils off. This is the principle widely used in the distillation method of determining the moisture content of wood and other materials. It has also been known that, when wet wood or other material is continuously extracted with a solvent that is miscible with water, the solvent will remove the water as well as the extractives from the wet material, even if the solvent is used cold or at any other temperature below the boiling point of water. Alcohol is a common example of such a solvent.

Dr. A. J. Stamm of the Forest Products Laboratory used the latter principle in a patented method of seasoning and treating green wood with paraffin in 1933. The potentialities of using this principle for the commercial drying of wood were not generally recognized, however, until the Western Pine Association Research Laboratory observed the drying action during a study of "pitch" removal from pine knots. A patent has been issued that covers the Western Pine Association developments. The Forest Products Laboratory has not extensively investigated the process developed by the Association nor the strength or other physical properties of wood dried by it.

In the Western Pine Association solvent seasoning method, lumber is stood on end in a closed drying chamber or extractor. Hot acetone or a similar polar solvent is continuously sprayed on the lumber until the desired amount of water has been removed. During the first step of this process, the water extraction period, some of the solvent containing water and wood extractives is pumped to a still for distillation. In this still the acetone is cleaned for reuse and the extractives are recovered as byproducts. When the solvent mixture is pumped from the drying chamber to the still, an equal amount of clean acetone is returned to the chamber.

The second step in the drying process, after the water extraction period, involves removal of residual solvent from the lumber. The drying chamber is heated above the boiling point of the solvent, and the heated vapors are circulated. Steam, at atmospheric pressure, is usually introduced during the later stages to assist solvent removal and avoid fire hazard.

Wood dries more rapidly by this method than by ordinary methods. The Association estimates that ponderosa pine can be solvent seasoned in 1/2 to 1/4 the time required for kiln drying, depending on type and size of lumber being seasoned. When optimum solvent seasoning conditions are used, these time schedules can be further reduced. Two reasons for this fast drying are the rapid rate of heat transfer by the liquid and the low relative humidity of the almost water-free acetone. In addition, the acetone is reported to flow vertically through the sapwood boards, thus bringing the drying medium into intimate contact with all the wood, not merely the surface as in ordinary drying methods. The acetone does not pass through the heartwood in the same way, although some does diffuse in from the sides of the boards. Heartwood dries more slowly and less pitch is extracted from it than from sapwood.

The process apparently does not reduce the strength of the wood. It is reported that the value of "pitchy" pine lumber is greatly increased because of the "pitch" removal and reduction of checking, splitting, and warping. In addition, the process yields extractives at the rate of approximately 60 pounds per thousand board feet. The practicability of this method of drying wood will depend upon the worth of these extractives as well as the savings resulting from shorter drying time and the added value of the improved lumber.

Pilot-plant testing of the process for ponderosa pine and other pines was carried out by the Association. The pilot unit processed 5,000 board feet per charge. Although the results indicated that processing costs, with estimated credits for extractives and upgrading, were lower than those of conventional drying methods, no commercial application has been made. The process may offer more advantage for slow-drying or difficult-to-dry species than for pines.

Extensive experimental work has been done at the University of California Forest Products Laboratory on application of the method to tanoak sapwood. Preliminary solvent-seasoning runs indicated that 4/4 sapwood could be dried to 10 percent moisture content in less than 30 hours. Many months

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of air drying, followed by careful kiln drying, are required to dry this item without excessive degrade by ordinary procedures. The experimentally dried material was relatively free of seasoning defects and drying stresses. A few of the boards contained a small area or streak of collapse believed to be due to the presence of heartwood or transitional heartwood. Results of the tests, as well as general illustrations of the method, are given in the reference by Anderson and Fearing. Commercial evaluation is being made for the extractive byproducts of various California species.

There is another special drying process, at one time called "solvent seasoning," that uses a commercial dry-cleaning solvent, perchloroethylene. The wood is placed horizontally in a closed chamber and submerged in the liquid. The liquid is heated until an azeotropic mixture of water and the solvent boils off. The vapors are collected in a condenser, separated, and the solvent returned to the cylinder. Since the solvent is not miscible with water, the drying phenomenon is similar to that of boiling-in-oil, which is described in Forest Products Laboratory Report 1665. This process has recently been called the McDonald process or azeotropic drying.

References

(1) Anonymous
1944. Extractor Plant Progressing. The Timberman 45(7):96.

(2) _____
1944. Solvent Seasoning. The Timberman 46(1):94, 96.

(3) _____
1946. Solvent Seasoned Wood. Proc. Wood Products Clinic 1:117-123, pub. by Spokane, Wash., Chamber of Commerce, Timber Products Bureau.

(4) _____
1943. Unique Lumber Seasoning Method. Canadian Lumberman 63(8):23.

(5) Anderson, A. B.
1946. Chemistry of Western Pines. Industrial and Engineering Chemistry, 38:450.

(6) _____, and Fearing, W. B., Jr.
1960. Solvent Seasoning of Tanoak. Forest Products Jour. 10(5):234-238.

(7) _____, and Hermann, A.
1950. Process of Treating Wood. (U.S. Patent No. 2,500,783) March 14.

(8) Hermann, A.
1948. Special Method of Seasoning Wood. Solvent Seasoning. Southern Lumberman 176(2211):88.

(9) McMillen, J. M.
1956. Special Methods of Seasoning Wood: Boiling-in-Oily-Liquids. U.S. Forest Products Laboratory Report No. 1665.

(10) Stamm, A. J.
1936. Method for Simultaneously Seasoning and Treating Water-Swollen Fibrous Materisls. (U.S. Patent No. 2,060,902) Nov. 17. (This patent has been dedicated to the free use of the people of the United States.)

(11) Venkatadas, R.
1955. Seasoning and Preservative Treatment of Green Northern White Pine with an Acetone Solution of Pentachlorophenol. Comp. Wood (India), 2(3):70-80.

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